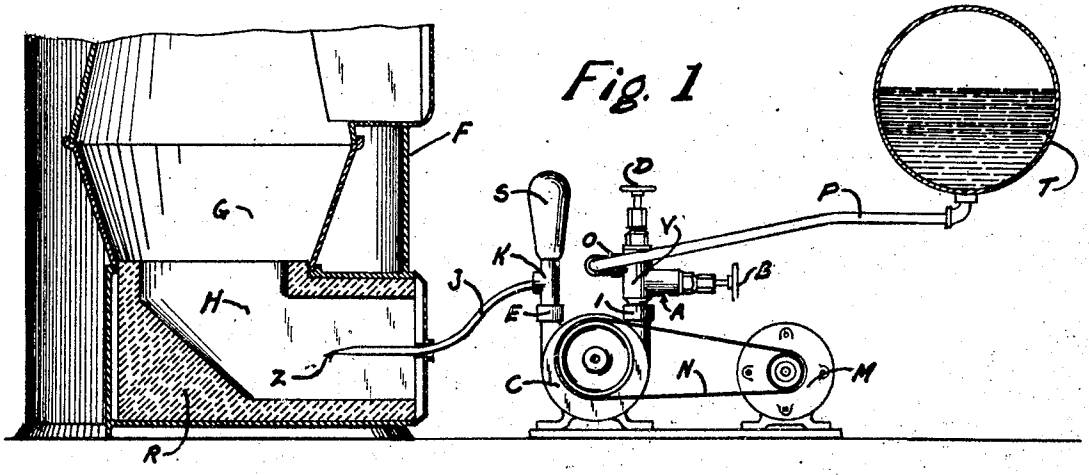
Aug. 19, 1930. A. E. CHISHOLM 1,773,477

OIL BURNER

Filed Dec. 22, 1925

Fig. 1



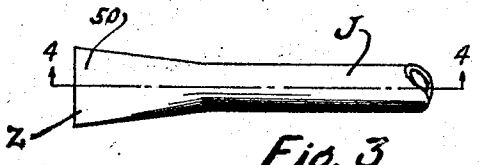


Fig. 3

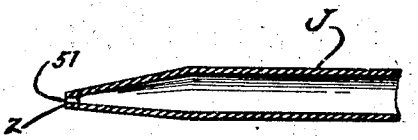


Fig. 4

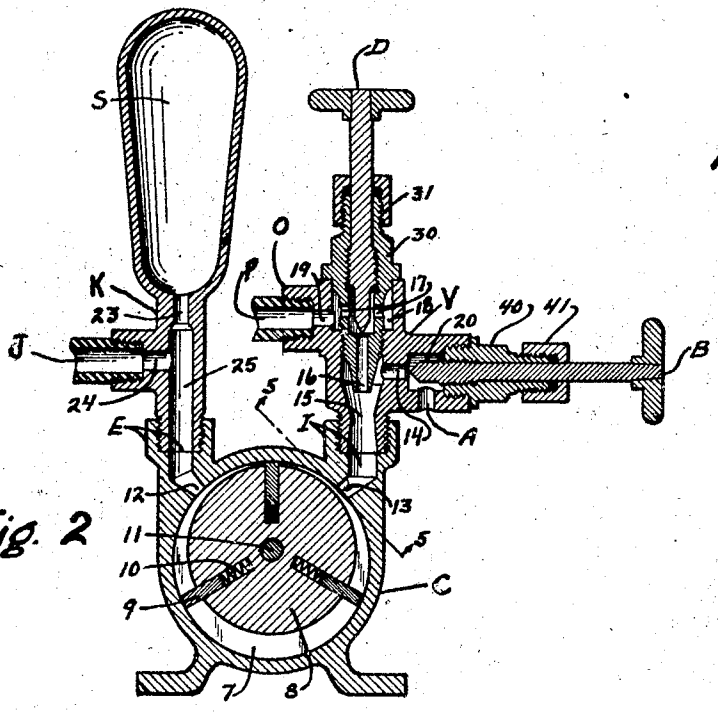
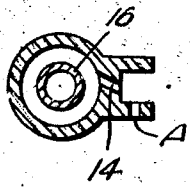


Fig. 2

Fig. 6.



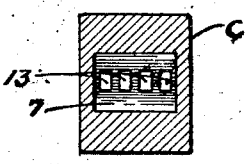


Fig. 5

Witnesses

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UNITED STATES PATENT OFFICE

ALLEN E. CHISHOLM, OF PORTLAND, OREGON

OIL BURNER

Application filed December 22, 1925. Serial No. 77,144.

It is characteristic of oil burners for the flame to roar and pulsate, and for domestic use, and any other purpose than furnaces of industrial plants, this is not only annoying, but a limiting factor in their use.

The roaring and pulsating is due to the incomplete vaporization of the fuel oil, and also to an insufficient intermixture of air with the oil vapor. This causes a retarded oxidization resulting in lost energy through incomplete combustion, and a consequent waste of fuel-oil. Furthermore, when the fuel-oil is insufficiently vaporized, it is not in condition to be thoroughly intermixed with a sufficient amount of air, and then the oil vapors will absorb the air from the combustion chamber, and in so doing burn with said objectionable roar. In other words, these simultaneous reactions to the oxidization cause violent disturbances of the atmosphere and as a result, roaring and pulsating, the pulsation being due to a periodic delivery of the pump.

The object of this invention is to provide a fuel-oil burner in which the fuel-oil, and the air with which it is to be intermixed will be drawn into separate valve controlled ports and the resultant intermixture will pass through the Venturi tube into the intake side of a pump.

A further object of my invention is to provide a fuel-oil burner comprising only few devices, and which will operate at a minimum cost.

Furthermore to provide means adapted to effect the thorough intermixture of vaporized fuel-oil and air, the relative proportions of which may be so controlled as to provide an amount of air sufficient to induce efficient combustion, but avoiding an undue excess of air, since excess air absorbs and carries away heat units, which wastes the fuel-oil.

I attain my object in a device comprising a rotary pump consisting of a rotary-body eccentric with the pump chamber, and pistons sliding in radial slots of said body; thus the pump functions to create a partial vacuum on its intake side and to cause compression in the pump chamber and expansion on its discharge side, thereby causing vaporizing, compression, and expansion of the fuel-oil, and promoting a thorough intermixture thereof with air.

Furthermore I provide independent valve controlled inlets for the fuel-oil and the air, and preferably pass the commixture through a Venturi tube to the intake port of the valve chamber, also for the purpose of promoting vaporization and intermixture of the fuel oil with air.

I further cause the pump to discharge through a nozzle adapted to emit a lesser volume of fluid than that discharged periodically by the pump, and provide a surge chamber into which the surplus of said discharged fluid is delivered.

Further details of the construction and operation of my burner are hereinafter fully described with reference to the accompanying drawings.

Figure 1 is an elevational view of my invention as applied to the use of burning fuel oil in a hot air furnace, in which portions of the apparatus are illustrated as sectional. Figure 2 is an elevational sectional view of items A B C D E K I S and V as illustrated in Fig. 1. Figure 3 is an enlarged plan view of item Z as illustrated in Fig. 1. Figure 4 is a sectional elevational view of Fig. 3 as at line 4—4. Figure 5 is a sectional view of Fig. 2 as at line 5—5 in which items A B D V and O have been omitted. Figure 6 is a section on line 6—6 of Figure 2.

Referring to corresponding parts by the same numerals and symbols of reference, F represents generally the major portion of a hot air heating furnace, G represents the firepot of the furnace when wood or coal is burned, H is the revised firepot or combustion chamber as used when fuel oil is burned, R is a lining of refractory material, T is a storage tank containing fuel oil, C represents a rotary pump having inlet connection I, outlet connection E and is operated by motor M thru belt N. A mixing device V consists of fuel inlet O, air inlet A, fuel control valve D, air control valve B, and is threadably connected to inlet I of pump C. A pipe P connects tank T with fuel inlet O. A discharge fitting K is surmounted by surge chamber S, and is threadably connected to outlet E of

pump C. Fitting K is also connected to pipe J which terminates in nozzle Z having ejection slot 51.

Referring now to Figure 2, the rotary pump C is illustrated as a positive displacement type of pump consisting of a chamber 7, a rotating member 8 that is located eccentrically within chamber 7, a shaft 11 that is secured to member 8 so that member 8 is free to rotate within chamber 7, vanes 9 which are supported within radial slots of member 8, springs 10 engage vanes 9 and cause the outer ends of said vanes to bear firmly against the inner surface of chamber 7, port 13 which communicates with inlet I, and port 12 which communicates with outlet E.

The mixing device V contains chambers 18 and 20, Venturi tube 15, ports 14 and 19 which communicate with openings A O and chambers 20 18 respectively. A valve member 30, having ports 17 and nozzle 16, is surmounted by packing gland 31, and is threadably connected to device V so as to enclose chamber 18, and to form a seal between chamber 18 and Venturi tube 15 when valve D is closed. A valve bonnet 40, which encloses valve B, is surmounted by packing gland 41, and is threadably connected to device V so as to enclose chamber 20. The discharge fitting K is threadably connected at one end to outlet E of pump C, the opposite end terminating in surge chamber S, and the middle portion having a port 24 which is connected to pipe J. A duct 25 connects pump outlet E with port 23, chamber S, port 24, and pipe J. Pipe J is flattened as at 50 so that a small rectangular slot is formed as at 51, thus forming a simple nozzle for the device.

The operation of my oil burner is as follows: The rotary displacement pump C is rotated clockwise by motor M, the design of the pump being such that clockwise rotation of rotor 8 will cause vanes 9 to exhaust vapors from inlet I and to discharge said vapors from outlet E, thus creating vacuum and pressure at inlet I and outlet E respectively. Valve B is opened so that inlet A connects with chamber 7 thru port 14, Venturi tube 15, inlet I, and port 13. Valve D is opened so that oil may flow from tank T, thru pipe P, oil inlet O, ports 19 and 17, nozzle 16, and thence to Venturi tube 15. Vacuum in the inlet I causes an inrush of air thru air inlet A, port 14, Venturi tube 15, inlet I, port 13, and thence to chamber 7. The port 14 for air is offset somewhat, approximately one-thirty-second of an inch, from a radial line with the axis of the oil nozzle 16, so that the air, on entering, is deflected to one side of the nozzle and being drawn towards the pump by the suction so created, is thus given a whirling motion about the nozzle 16 before being drawn thru Venturi tube 15. This whirling motion partially vaporizes the liquid flowing from nozzle 16, thus causing a partial mixture of the liquid and air. As this partial mixture passes into Venturi tube 15, the constricted throat of same causes an increase in the velocity of flow of the partial mixture. The liquid is greater in weight than the air. Hence the acceleration of the liquid particles to a higher velocity is slower than the acceleration of the air and previously vaporized portion of the liquid, and a friction between air and liquid is created which is sufficient to vaporize the remaining portion of the liquid as both fluids pass thru the constricted throat of Venturi tube 15 and thence to chamber 7 of pump C.

The liquid and air are relatively cool before entering mixing valve B. The tendency of vaporized matter to expand creates a resultant rise in temperature when confined, which rise in temperature is further increased by the compression in pump chamber 7, and tends to vaporize whatever liquid portion of the fuel-oil remains. The resulting intermixture of the vaporized fuel-oil is then forced through the port 12, the chamber 25, the surge chamber S, and the nozzle J, where the sudden release of pressure delivers it in the combustion chamber H in a finely divided state proper for rapid and noiseless combustion. It will be noted that the oil vapor within chamber 7 will afford ample lubrication for rotor 8 and vanes 9, and that no other means of lubrication is necessary.

A vacuum created through the Venturi tube causes an inrush of air through the inlet port, which being deflected by a conical nozzle is given a whirling motion. The fuel oil passing through a similar nozzle is atomized and the whirling motion tends to cause a partial intermixture of the vaporized fuel-oil and air. As this incomplete mixture reaches the Venturi tube, the constricted throat of the latter causes an increase in the velocity of the commixture, and as the fuel-oil is heavier than the air, the air will be accelerated before the oil particles, and a friction between the two will be created which tends to complete the vaporization of the fuel-oil particles.

As the commixture then passes through the common intake port into the pump chamber, it is compressed by the rotary displacement pump thereby raising the temperature of the commixture and further promoting vaporization and intermixture. This commixture is then discharged by the pump through the outlet of its chamber; a portion passing through to the nozzle in the combustion chamber and the surplus due to the periodic delivery of the pump into a surge chamber to be later utilized as the pulsating flow falls to its lowest point. The sudden release of pressure and ensing expansion at the nozzle tends to more finely atomize the commixture for ready combustion, thus a constant flow of finely vaporized fuel-oil is provided.

From the foregoing description it will be noted that just sufficient air and liquid fuel is admitted to mixing device V to effect complete combustion and that sufficient lubrication is provided by the liquid fuel to eliminate friction losses, hence the effort required to operate the device is reduced to a minimum. It will be further noted that the mechanical motion of the device and the heat generated by compressing the fluid is utilized to promote and maintain vaporization, hence the natural characteristics of the mechanical means are utilized so that a maximum of mechanical effort is expended in accomplishing and maintaining vaporization of the liquid affected. It will be still further noted that the vaporizing medium (air) need only be used in sufficient quantity to provide complete oxidation for the combustible liquid, hence the device will effect efficient combustion without the use of large quantities of excess air.

A rotary displacement pump of the type hereinafter described, I consider to be the only type of pump adapted to the above described means of delivering vaporized fuel-oil to the combustion chamber, in the proper condition for complete oxidization. A rotary pump set concentrically in its chamber cannot compress the vaporized fuel-oil, and would have a tendency to allow the vapor to condense.

While I have shown and described a preferred embodiment of my invention it will be understood that changes may be made in details of design and construction without departing from the principles and spirit of my invention.

What I claim as new and desire to cover by Letters Patent is:—

An oil mixing device for fuel oil burners, including a section formed with an oil inlet, a valve member removably secured within the section and forming with the section a chamber open to the oil inlet and beyond the valve member, the wall of the valve member being formed with openings communicating with said chamber, a valve controlled passage formed in the valve member below said openings in the direction of oil flow, a nozzle formed on the oil member at the terminal of the valve controlled passage, said section below the nozzle having a Venturi tube form, and a valve controlled air inlet opening into the section immediately above the nozzle and directing the flow of the incoming air to one side of the nozzle to cause said air to be given a whirling motion about the nozzle to assist in vaporizing the oil flowing from the nozzle.

In testimony whereof I affix my signature.

ALLEN E. CHISHOLM.